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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/720,579	11/24/2003	Sangyum Kim	1772-5	5710
24106 7590 05/29/2009 EGBERT LAW OFFICES 412 MAIN STREET, 7TH FLOOR HOUSTON, TX 77002			EXAMINER WONG, EDNA	
			ART UNIT 1795	PAPER NUMBER
			MAIL DATE 05/20/2009	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/720,579

**Applicant(s)**

KIM ET AL.

**Examiner**

EDNA WONG

**Art Unit**

1795

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 December 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 32-39 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 32-39 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date: \_\_\_\_\_

This is in response to the Amendment dated December 2, 2008. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office Action.

### ***Response to Arguments***

#### **Claim Objections**

Claim 27 has been objected to because of minor informalities.

The objection of claim 27 has been withdrawn in view of Applicants' amendment. Claim 27 has been cancelled.

#### **Claim Rejections - 35 USC § 103**

Claims **23-31** have been rejected under 35 U.S.C. 103(a) as being unpatentable over **Wolski et al.** (US Patent No. 5,834,140) in combination with **Yates et al.** (US Patent No. 5,863,410), **Merchant et al.** (US Patent No. 5,863,666), **WO 01/53569 A1** ('569) and **Sekiguchi et al.** (US Patent No. 6,562,222 B1).

The rejection of claims 23-31 under 35 U.S.C. 103(a) as being unpatentable over Wolski et al. in combination with Yates et al., Merchant et al., WO 01/53569 A1 ('569) and Sekiguchi et al. has been withdrawn in view of Applicants' amendment. Claims 23-31 have been cancelled.

***Claim Rejections - 35 USC § 103***

I. Claims **32-39** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Wolski et al.** (US Patent No. 5,834,140) [‘140] in view of **Yates et al.** (US Patent No. 5,863,410), **Merchant et al.** (US Patent No. 5,863,666), **WO 01/53569 A1** (‘569), **Sekiguchi et al.** (US Patent No. 6,562,222 B1) and **Whalen** (“Polymer Technology Dictionary”, © 1994, p. 256).

*Sekiguchi is the English equivalent of WO 01/53569.*

Wolski ‘140 teaches a method for manufacturing an electrodeposited copper foil comprising:

(a) forming an electrolyte solution **3** (= an electrolyte) [col. 3, line 3] containing a sulfuric acid (col. 6, lines 53-56; and col. 8, lines 45-47) and a copper ion (= from copper sulfate) [col. 6, lines 53-56; and col. 8, lines 45-47] and a chloride ion (col. 6, lines 14-29);

(b) adding an additive to said electrolyte solution, said additive consisting of 0.1 ppm to 100 ppm of gelatin (= 0.3 to 35 ppm by weight) [col. 5, lines 42-54; col. 6, lines 10-11; and col. 12, lines 41-43] and 0.05 ppm to 50 ppm of hydroxyethyl cellulose (= 0.1 to 15 ppm by weight) [col. 5, lines 18-30; col. 6, lines 9-10; and col. 8, line 50];

(c) submerging a rotating drum **2** (= a drum-shaped cathode) and an anode plate **1** in said electrolyte solution **3**, said anode plate having a curved shaped and spaced by a distance from an outer surface of the drum (= provided to a concentric circle shape to said cathode **2**) [col. 3, lines 3-13; and Fig. 1]; and

(d) applying a negative current (= cathode) to said drum **2** and a positive current (= anode) to said anode plate **1** so to deposit the copper foil **4** onto said outer surface of said drum (= to deposit copper on the surface of said cathode) [col. 3, lines 9-13].

The gelatin being an amount of between 2 ppm to 5 ppm (= 0.3 to 35 ppm by weight) [col. 5, lines 42-54; col. 6, lines 10-11; and col. 12, lines 41-43].

The hydroxyethyl cellulose being an amount of between 1 ppm to 3 ppm (= 0.1 to 15 ppm by weight) [col. 5, lines 18-30; col. 6, lines 9-10; and col. 8, line 50].

The deposited copper foil has a matte side and a shiny side (col. 3, lines 55-58), said matte side having a roughness greater than a roughness of said shiny side (= the so-called shiny side which is a surface at the side of contacting with the drum has a relatively smooth surface, but at the reverse surface called a matte side, unevenness is relatively remarkable) [col. 3, lines 55-58].

The sulfuric acid being an amount of 50 to 200 g/l (= 110 g/l of sulfuric acid) and said copper ion being in an amount of 30 to 150 g/l (= 90 g/l of copper) [col. 8, lines 45-48].

The electrolyte solution being at a temperature of between 20 and 80°C (= 58°C) [col. 8, Table 1, "Temperature"].

The electrolyte has a negative current density of between 20 and 150 A/dm<sup>2</sup> (= 50 A/dm<sup>2</sup>) [col. 8, Table 1, "Current density"].

The method of Wolski '140 differs from the instant invention because Wolski '140 does not disclose the following:

- a. Wherein the additive consists of 0.05 ppm to 20 ppm of

bis(sodiumsulfopropyl)disulfide, as recited in claim 32.

- b. Wherein said bis(sodiumsulfopropyl)disulfide is an amount of between 0.5 ppm to 3 ppm, as recited in claim 35.

Wolski '140 teaches that:

In the present invention, an additive which is a base of a combination is 3-mercaptop 1-propanesulfonate as a compound having a mercapto group. 3-Mercapto 1-propanesulfonate is a compound representatively shown by  $HS(CH_2)_3SO_3R$  or the like, wherein R represents an alkali metal atom such as lithium, sodium, potassium, etc.

Among these, sodium is particularly preferred as an alkali metal atom. This compound does not have a strong effect of making copper crystal fine when it is used alone. However, by using the compound in combination with other organic compound, copper crystal can be made fine and a plating surface having less unevenness can be obtained. Detailed action and mechanism thereof have not yet been clarified, but it is estimated that a molecule of the compound is reacted with a copper ion in a copper sulfate electrolyte to be converted into a complex, or the compound acts on a plating interface to elevate overvoltage, whereby copper crystal can be made fine and a plating surface having less unevenness can be formed (col. 4, line 66 to col. 5, line 17; and col. 6, lines 30-35).

Like Wolski '140, **Yates** teaches an electrolytic process for producing copper foil having a low profile surface (col. 1, lines 7-11).

Yates teaches that:

Water soluble, sulfonated organic sulfur compounds:

Such compounds often form complex salts with metals, which is helpful in formation of stable interfacial films.

As an example, 2-mercaptobenzothiazole (MBT) due to its ability to react with copper, with the resulting formation of protective films, found an extensive use as a corrosion inhibitor in recirculating cooling water systems, to protect copper and copper alloys.

Many simple bivalent **sulfur organic compounds** possess similar ability and thus be useful as addition agents in electrodeposition of copper.

These substances can belong to the group of aliphatic thiols, R-SH, sulfides,  $R^1-S-R^2$ , disulfides,  $R^1-S-S-R^2$ , as well as aromatic and heterocyclic thiols, sulfides and disulfides.

Such substances have, usually, non-polar and hydrophobic molecules. To make them useful as addition agents in electroplating they are sulfonated, i.e., sulfonic acid group  $SO_3H$  is introduced into the structure of a molecule in place of a hydrogen atom (col. 10, line 55 to col. 11, line 7).

Like Yates, **Merchant** teaches an electrolytic process for producing copper foil (col. 3, lines 59-62).

Merchant teaches that:

It is critical that the concentration of **organic additives** in the electrolyte solution be at least about 0.3 ppm. The organic additives can be one or more gelatins. The gelatins that are useful herein are heterogeneous mixtures of water-soluble proteins derived from collagen. Animal glue is a preferred gelatin. The organic additive can be selected from the group consisting of saccharin, caffeine, molasses, guar gum, gum arabic, thiourea, the polyalkylene glycols (e.g., polyethylene glycol, polypropylene glycol, polyisopropylene glycol, etc.), dithiothreitol, amino acids (e.g., proline, hydroxyproline, cysteine, etc.), acrylamide, sulfopropyl disulfide, tetraethylthiuram disulfide, alkylene oxides (e.g., ethylene oxide, propylene oxide, etc.), the sulfonium alkane sulfonates, thiocarbamoydisulfide, or derivatives or mixtures of two or more thereof. (col. 4, line 64 to col. 5, line 15).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the additive described by Wolski '140 with wherein the additive consists of 0.05 ppm to 20 ppm of bis(sodiumsulfopropyl)disulfide; and wherein said bis(sodiumsulfopropyl)disulfide is an amount of between 0.5 ppm to 3 ppm because the 3-Mercapto 1-propanesulfonate disclosed by Wolski is a compound representatively shown by  $HS(CH_2)_3SO_3R$ . The compound can also be the like.

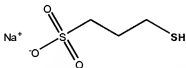
Since a disulfide,  $R^1-S-S-R^2$ , would have been a functionally equivalent to the aliphatic thiols, R-SH, as taught by Yates (col. 10, line 55 to col. 11, line 15), a

sulfopropyl disulfide would have been an obvious disulfide to use in the electrolytic process for producing copper foil as taught by Merchant (col. 4, line 64 to col. 5, line 15), and a bis(sodiumsulfopropyl)disulfide would have been an obvious sulfopropyl disulfide to use in the electrolytic process for producing copper foil because bis-(3-sulfopropyl) disulfide disodium salt and sodium 3-mercapto-1-propanesulfonate are functionally equivalent organic sulfur compounds as taught by *Sekiguchi* (col. 5, lines 66 to col. 6, line 7).

Thus, bis(sodiumsulfopropyl)disulfide would have been the like of 3-mercapto 1-propanesulfonate and would have possessed similar abilities.

Furthermore, it is *prima facie* obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose. The idea of combining them flows logically from their having been individually taught by the prior art (MPEP § 2144.06).

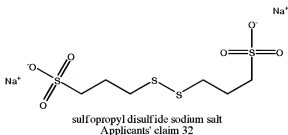
Furthermore, Wolski '140 teaches:



sodium 3-mercapto-1-propanesulfonic acid  
Wolski (col. 4, line 66 to col. 5, line 4; and  
col. 8, line 49)

The bis(sodiumsulfopropyl)disulfide as presently claimed would be the sodium 3-mercapto-1-propanesulfonate constituent in double the proportion of the constituent:





Structural relationships may provide the requisite motivation or suggestion to modify known compounds to obtain new compounds (MPEP § 2144.08(II)(A)(4)(c) and §2144.09).

c. Wherein said gelatin has a molecular weight of greater than 10000, as recited in claim 32.

Wolski '140 teaches that the commercially available products have weight average molecular weights (Mw) of 10,000 or less (col. 5, lines 42-54).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the molecular weight of the gelatin described by Wolski '140 with wherein said gelatin has a molecular weight of greater than 10000 because a *prima facie* case of obviousness exists where claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties (MPEP § 2144.05(I)).

For example, a Mw of 10,000 versus a Mw of 10,001. A difference of 1 does not appear to produce new and unexpected results which are different in kind and not merely in degree from results of the prior art, even though Applicant's modification

results in great improvement and utility over the prior art, it may still not be patentable if the modification was within capabilities of one skilled in the art.

Furthermore, the Mw of 10,000 disclosed by Wolski is an average. Thus, this single value summarizes or represents the general significance of a set of unequal values which would have included weights below 10,000 and above 10,000.

**Whalen** teaches the definition of "molecular weight average". Polymers do not have a single *molecular weight* as they are made from chains of varying length.

d.      Wherein said chloride ion is in an amount of 200 mg/l, as recited in claim 37.

Further, in addition to the above organic additive, a chloride ion is added to the electrolyte. When no chloride ion exists in the electrolyte, the desired copper foil having a matte side which is low-profiled cannot be obtained. Its amount to be added may be several ppm by which the effects exhibit, but in order to produce a low-profiled copper foil in a broad current density range stably, it is preferred to keep the amount in a range of 10 to 60 ppm. Even when the amount exceeds 60 ppm, low profiling can be effected. However, the effect of low profiling is not increased significantly accompanied with increase in the amount, and when the amount is excessive, dendritic electrodeposition occurs or limiting current density is lowered. As the method of adding the chloride ion, hydrochloric acid or sodium chloride is dissolved in water and the aqueous solution is added to the electrolyte (col. 6, lines 14-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the chloride ion described by Wolski '140 wherein said chloride ion is in an amount of 200 mg/l because when the amount exceeds 60 ppm, low profiling would have still been effected as taught by Wolski '140 (col. 6, lines 14-29).

Furthermore, the concentration of chloride ions is a result-effective variable and one skilled in the art has the skill to calculate the concentration that would have determined the success of the desired reaction to occur, e.g., to produce a low-profiled copper foil in a broad current density range stably (MPEP § 2141.03 and § 2144.05(II)(B)).

II. Claims **32-39** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Wolski et al.** (US Patent No. 5,215,646) [‘646] in view of **Wolski et al.** (US Patent No. 5,834,140) [‘140], **Yates et al.** (US Patent No. 5,863,410), **Merchant et al.** (US Patent No. 5,863,666), **WO 01/53569 A1** (‘569) and **Sekiguchi et al.** (US Patent No. 6,562,222 B1).

*Sekiguchi is the English equivalent of WO 01/53569.*

Wolski ‘646 teaches a method for manufacturing an electrodeposited copper foil comprising:

- (a) forming an electrolyte solution **33** (= an electrolyte) [col. 5, line 50] containing a sulfuric acid (=  $H_2SO_4$ ) and a copper ion (= Cu) [col. 17, lines 1-10];
- (b) adding an additive to said electrolyte solution, said additive consisting of gelatin and hydroxyethyl cellulose (= 1 g/l high molecular weight gelatin and 1 g/l hydroxyethyl cellulose) [col. 16, lines 60-64; and col. 17, lines 15-16], said gelatin having a molecular weight of greater than 10000 (col. 16, lines 60-64);
- (c) submerging a rotating drum **21** (= a large cylindrical drum-cathode) and an

anode plate **24, 25** in said electrolyte solution **33**, said anode plate having a curved shaped (= a pair of heavy, lead curved primary anodes) and spaced by a distance from an outer surface of the drum (= the spacing between the nearby facing edges of these anodes provides an entry for the injection of the electrolyte which circulates in the gap **26a** between the drum **21** and the inner surfaces of the anodes **24** and **25**) [col. 5, lines 21-36; and Fig. 1]; and

(d) applying a negative current to said drum **21** and a positive current to said anode plate (= both the drum and each of the anodes are connected electrically by heavy bus-bars **30** to one of two separate DC power sources **28** and **29**) [col. 5, lines 42-47] so to deposit the copper foil **34** onto said outer surface of said drum (= as the drum rotates in the electrolyte and the electrical current is passed through the electrolyte in gap **26** an electrodeposit of metal, e.g., copper, forms on the drum surface **23**) [col. 5, lines 48-56].

The deposited copper foil has a matte side and a shiny side (col. 5, lines 60-63), said matte side having a roughness greater than a roughness of said shiny side (= the matte side of foil **34** is not smooth) [col. 9, lines 58-59].

The sulfuric acid being an amount of 50 to 200 g/l (= 40-150 g/l  $\text{H}_2\text{SO}_4$ ) and said copper ion being in an amount of 30 to 150 g/l (= 30-100 g/l Cu) [col. 17, lines 1-10].

The electrolyte solution being at a temperature of between 20 and 80°C (= 100°F - 180°F) [col. 17, lines 1-10].

The electrolyte has a negative current density of between 20 and 150 A/dm<sup>2</sup> (=

20-100 A/dm<sup>2</sup>) [col. 17, lines 29-31].

The method of Wolski '646 differs from the instant invention because Wolski '646 does not disclose the following:

- a. Wherein the electrolyte solution contains a chloride ion, as recited in claim 32.

Like Wolski '646, **Wolski '140** teaches method for producing copper foil (col. 1, lines 8-12).

Wolski '140 teaches that:

Further, in addition to the above organic additive, a chloride ion is added to the electrolyte. When no chloride ion exists in the electrolyte, the desired copper foil having a matte side which is low-profiled cannot be obtained. Its amount to be added may be several ppm by which the effects exhibit, but in order to produce a low-profiled copper foil in a broad current density range stably, it is preferred to keep the amount in a range of 10 to 60 ppm. Even when the amount exceeds 60 ppm, low profiling can be effected. However, the effect of low profiling is not increased significantly accompanied with increase in the amount, and when the amount is excessive, dendritic electrodeposition occurs or limiting current density is lowered. As the method of adding the chloride ion, hydrochloric acid or sodium chloride is dissolved in water and the aqueous solution is added to the electrolyte (col. 6, lines 14-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the electrolyte solution described by Wolski '646 with wherein the electrolyte solution contains a chloride ion because when no chloride ion exists in the electrolyte, the desired copper foil having a matte side which is low-profiled would not have been obtained as taught by Wolski '140 (col. 6, lines 14-29).

- b.      Wherein said chloride ion is in an amount of 200 mg/l, as recited in claim 37.

Wolski '140 teaches that:

Further, in addition to the above organic additive, a chloride ion is added to the electrolyte. When no chloride ion exists in the electrolyte, the desired copper foil having a matte side which is low-profiled cannot be obtained. Its amount to be added may be several ppm by which the effects exhibit, but in order to produce a low-profiled copper foil in a broad current density range stably, it is preferred to keep the amount in a range of 10 to 60 ppm. Even when the amount exceeds 60 ppm, low profiling can be effected. However, the effect of low profiling is not increased significantly accompanied with increase in the amount, and when the amount is excessive, dendritic electrodeposition occurs or limiting current density is lowered. As the method of adding the chloride ion, hydrochloric acid or sodium chloride is dissolved in water and the aqueous solution is added to the electrolyte (col. 6, lines 14-29).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the electrolyte solution described by Wolski '646 because when the amount exceeds 60 ppm, low profiling would have still been effected as taught by Wolski '140 (col. 6, lines 14-29).

Furthermore, the concentration of chloride ions is a result-effective variable and one skilled in the art has the skill to calculate the concentration that would have determined the success of the desired reaction to occur, e.g., to produce a low-profiled copper foil in a broad current density range stably (MPEP § 2141.03 and § 2144.05(II)(B)).

- c.      0.1 ppm to 100 ppm of gelatin and 0.05 ppm to 50 ppm of hydroxyethyl cellulose, as recited in claim 32.

d. Wherein said gelatin being an amount of between 2 ppm to 5 ppm, as recited in claim 33.

e. Wherein said hydroxyethyl cellulose being an amount of between 1 ppm to 3 ppm, as recited in claim 34.

Wolski '646 teaches 1 g/l high molecular weight gelatin and 1 g/l hydroxyethyl cellulose (col. 16, lines 60-64; and col. 17, lines 15-16).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the concentrations of gelatin and hydroxyethyl cellulose described by Wolski '646 with (c) to (e) above because it has been held that changes in temperature, concentration or both, is not a patentable modification; however, such changes may impart patentability to a process if the ranges claimed produce new and unexpected results which are different in kind and not merely in degree from results of the prior art, such ranges are termed "critical" ranges and Applicant has the burden of proving such criticality; even though Applicant's modification results in great improvement and utility over the prior art, it may still not be patentable if the modification was within capabilities of one skilled in the art; more particularly, where general conditions of the claim are disclosed in the prior art, it is not inventive to discover optimum or workable ranges by routine experimentation. *In re Aller*, 220 F2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) and MPEP § 2144.05.

f. Wherein the additive consists of 0.05 ppm to 20 ppm of

bis(sodiumsulfopropyl)disulfide, as recited in claim 32.

g. Wherein said bis(sodiumsulfopropyl)disulfide is an amount of between 0.5 ppm to 3 ppm, as recited in claim 35.

Like Wolski '646, **Yates** teaches an electrolytic process for producing copper foil having a low profile surface (col. 1, lines 7-11).

Yates teaches that:

Water soluble, sulfonated organic sulfur compounds:

Such compounds often form complex salts with metals, which is helpful in formation of stable interfacial films.

As an example, 2-mercaptobenzothiazole (MBT) due to its ability to react with copper, with the resulting formation of protective films, found an extensive use as a corrosion inhibitor in recirculating cooling water systems, to protect copper and copper alloys.

Many simple bivalent sulfur organic compounds posses similar ability and thus be useful as addition agents in electrodeposition of copper.

These substances can belong to the group of aliphatic thiols, R-SH, sulfides,  $R^1-S-R^2$ , disulfides,  $R^1-S-S-R^2$ , as well as aromatic and heterocyclic thiols, sulfides and disulfides.

Such substances have, usually, non-polar and hydrophobic molecules. To make them useful as addition agents in electroplating they are sulfonated, i.e., sulfonic acid group  $SO_3H$  is introduced into the structure of a molecule in place of a hydrogen atom (col. 10, line 55 to col. 11, line 7).

Like Yates, **Merchant** teaches an electrolytic process for producing copper foil (col. 3, lines 59-62).

Merchant teaches that:

It is critical that the concentration of organic additives in the electrolyte solution be at least about 0.3 ppm. The organic additives can be one or more gelatins. The gelatins that are useful herein are heterogeneous mixtures of water-soluble proteins derived from collagen. Animal glue is a preferred gelatin. The organic additive can be selected from the group consisting of saccharin, caffeine, molasses, guar gum, gum arabic, thiourea, the polyalkylene glycols (e.g., polyethylene glycol, polypropylene glycol, polyisopropylene glycol, etc.), dithiothreitol, amino acids (e.g., proline,



hydroxyproline, cysteine, etc.), acrylamide, sulfopropyl disulfide, tetraethylthiuram disulfide, alkylene oxides (e.g., ethylene oxide, propylene oxide, etc.), the sulfonium alkane sulfonates, thiocarbamoydisulfide, or derivatives or mixtures of two or more thereof. (col. 4, line 64 to col. 5, line 15).

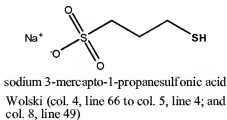
It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the additive described by Wolski '646 with wherein the additive consists of 0.05 ppm to 20 ppm of bis(sodiumsulfopropyl)disulfide; and wherein said bis(sodiumsulfopropyl)disulfide is an amount of between 0.5 ppm to 3 ppm because such a compound would formed complex salts with metals, which is helpful in formation of stable interfacial films as taught by Yates (col. 10, line 55 to col. 11, line 7).

Since a disulfide,  $R^1-S-S-R^2$ , would have been a functionally equivalent to the aliphatic thiols,  $R-SH$ , as taught by Yates (col. 10, line 55 to col. 11, line 15), a sulfopropyl disulfide would have been an obvious disulfide to use in the electrolytic process for producing copper foil as taught by Merchant (col. 4, line 64 to col. 5, line 15), and a bis(sodiumsulfopropyl)disulfide would have been an obvious sulfopropyl disulfide to use in the electrolytic process for producing copper foil because bis-(3-sulfopropyl) disulfide disodium salt and sodium 3-mercapto-1-propanesulfonate are functionally equivalent organic sulfur compounds as taught by **Sekiguchi** (col. 5, lines 66 to col. 6, line 7).

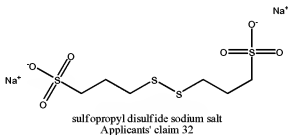
Furthermore, it is *prima facie* obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose. The idea of combining them flows

logically from their having been individually taught by the prior art (MPEP § 2144.06).

Furthermore, bis(sodiumsulfopropyl)disulfide would have been the like of 3-mercapto 1-propanesulfonate and would have possessed similar abilities. Wolski teaches:



The bis(sodiumsulfopropyl)disulfide as presently claimed would be the sodium 3-mercapto-1-propanesulfonate constituent in double the proportion of the constituent:



Structural relationships may provide the requisite motivation or suggestion to modify known compounds to obtain new compounds (MPEP § 2144.08(II)(A)(4)(c) and §2144.09).

#### **RE: REMARKS**

Applicants state that the disclosure of the group of bivalent sulfur organic compounds by the prior art does not make the particular selection of SPS obvious for

patenting.

In response, Sekiguchi teaches that bis-(3-sulfopropyl) disulfide disodium salt and sodium 3-mercapto-1-propanesulfonate are functional equivalents (col. 5, lines 66 to col. 6, line 7). The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination (MPEP § 2144.07).

Considering the prior art references in its entirety, i.e., as a whole, one having ordinary skill in the art would have expected and/or envisaged that bis-(3-sulfopropyl) disulfide disodium salt and sodium 3-mercapto-1-propanesulfonate would have possessed similar abilities.

Furthermore, the reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by the Applicants. *In re Linter* 458 F.2d 1013, 173 USPQ 560 (CCPA 1972); *In re Dillon* 919 F.2d 688, 16 USPQ2d 1897 (Fed. Cir. 1990), *cert. denied*, 500 US 904 (1991); and MPEP § 2144.

Applicants state that although the Merchant patent discloses SPS, the Merchant patent does not teach the amounts and conditions of the SPS composition of the present invention.

In response, the rejection is not overcome by pointing out that one reference does not contain a particular limitation when reliance for that teaching is on another

reference. *In re Lyons* 150 USPQ 741 (CCPA 1966). Moreover, it is well settled that one cannot show nonobviousness by attacking the references individually where, as here, the rejection is based on a combination of references. *In re Keller* 208 USPQ 871 (CCPA 1981); *In re Young* 159 USPQ 725 (CCPA 1968).

Applicants state that the wide number of reference that are used so as to disclose the various components identified in the new independent Claim 32 is also evidence of the "non obviousness" of independent Claim 32. Fundamentally, Applicant respectfully contends that one having ordinary skill in the art would not be likely to combine the various components of five (5) separate references in order to produce the very low roughness electrodeposited copper foil of the present invention.

In response, reliance on a large number of references in a rejection does not, without more, weigh against the obviousness of the claimed invention. See *In re Gorman*, 933 F.2d 982, 18 USPQ2d 1885 (Fed. Cir. 1991).

### **Citations**

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

**Parsons et al.** ("Effect of Gelatin on the Changes in Initial Cathode Polarization During Electrodeposition of Copper", *Canadian J. of Chem.* (1954), Vol. 32, pp. 581-590) is cited to teach that fractionation of the stock gelatin by coacervation gave two

portions of molecular weights 94,500 and 14,500, while average molecular weights ranging from 55,000 to 9,500 were obtained by degrading a 1% gelatin solution at 100°C (page 585).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EDNA WONG whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Edna Wong/  
Primary Examiner  
Art Unit 1795

EW  
April 3, 2009